

**TITLE OF THE INVENTION**

Structure for Mounting Cameras on a Vehicle

**BACKGROUND OF THE INVENTION**

5        The present invention relates to a structure for mounting cameras on a vehicle, and more particularly to a mounting structure of cameras which are mounted on a vehicle for obtaining forward environmental data while running in a vehicle drive supporting system.

10      In recent years, a vehicle drive supporting system with a camera mounted on a vehicle has been proposed, wherein information for safety is supplied to a driver, or a vehicle control is automatically performed, based on the forward data in a vehicle running direction which are obtained by the camera 15      while running.

20      Conventionally, as a mounting structure of a camera mounted on a vehicle, a structure described in a publication of Japanese Patent Application Laid-Open No. 11-78717 has been known. The publication discloses a structure for mounting a camera inside 25      a front windshield (front glass) of a vehicle, or for mounting a camera as a unit on a room mirror for confirming a rearward direction.

30      When the mounting structure described in the above-mentioned publication is applied to so-called stereo cameras which have one camera on the right and left sides, respectively, two cameras are mounted on each side of a front glass through a stay. However, in this mounting method, there are problems that each position of the both cameras is apt to be relatively tilted because of unavoidable unevenness when manufacturing the front 35      glass and a vehicle body. If each position of cameras is deviated from a correct position thereof, an accuracy of obtained image data may be lowered. As a result, for example, it may be not accurately performed to measure a distance between an own car and a forward running car, so that the vehicle drive supporting system can not be accurately operated.

Furthermore, since the cameras are independently fixed on the front glass through the stay according to the

conventional method, a relative accuracy of an optical axis between the cameras mounted on the both sides is apt to change because of vibration caused while running, a distortion of vehicle body, and a temperature difference inside a vehicle, 5 so that the accuracy of obtained image data is lowered. In addition, a posture such as angle must be adjusted in each camera upon manufacturing, wherein it takes much time to do so. As a result, a productive efficiency thereof is lowered.

10 **SUMMARY OF THE INVENTION**

The present invention has been developed in view of the aforementioned problems, and an object of the present invention is to provide a structure for mounting cameras on a vehicle wherein a relative position between cameras disposed on the both sides 15 can be accurately kept even if vibration while running and/or a temperature difference inside a vehicle influences the cameras, so that an accuracy of the obtained image data is not lowered under any situation.

A first aspect of the present invention is to provide 20 a structure for mounting cameras on a vehicle comprising a chassis having a predetermined length and extended in a lateral direction, a pair of cameras mounted on both sides of a vehicle for making a film of a forward road environment when running, each camera being mounted on both ends of the chassis, and a mounting 25 seat member formed in a center of the chassis, wherein the mounting seat member is fixed onto a predetermined mounting position of a vehicle body so as to mount the pair of cameras on the vehicle body, and portions other than the mounting seat member of the chassis are 30 disposed apart from the vehicle body.

According to the above-mentioned constructions, since the two cameras are mounted on the both ends of the chassis, the relative accuracy of each optical axis between the right and left cameras can be prevented from lowering due to vibration when 35 running or temperature difference. Also, since the chassis is fixed onto the vehicle body with a small compressed area, the image data obtained from the both cameras suffers little influence

of vibration when running, and the like, so that the reliability of a drive supporting system can be improved.

A second aspect of the present invention is to provide the structure for mounting cameras on a vehicle according to the 5 first aspect which a taper plate further intervenes between the mounting seat member and the mounting position on the vehicle body when fixing the chassis onto the mounting position of the vehicle body.

A third aspect of the present invention is to provide 10 the structure for mounting cameras on a vehicle according to the first aspect which a plurality of taper plates are further prepared in advance, the taper plates being formed by wedge-like plates with different taper angle when fixing the chassis onto the mounting position of the vehicle body, wherein 15 the taper plate having the most adequate taper angle of the plurality of taper plates intervenes between the mounting seat member and the vehicle body so as to dispose the pair of cameras mounted on the chassis in the predetermined mounting position of the vehicle body.

20 According to the above-mentioned second and third constructions, since the taper plate intervenes between the mounting seat member and a front rail of the vehicle body, it becomes easy to adjust the direction of the optical axis of the right and left cameras, so that a manufacturing efficiency can 25 be improved.

A fourth aspect of the present invention is to provide the structure for mounting cameras on a vehicle according to the first to third aspects further comprising falling prevention members for engaging the both ends of the chassis with the vehicle 30 body.

According to the above-mentioned fourth construction, since 35 the falling prevention member is provided on the both ends of the chassis, it becomes easy to mount the chassis onto the vehicle body.

**BRIEF DESCRIPTION OF THE DRAWINGS**

These and other objects and advantages of the present invention will become clear from the following description with reference to the accompanying drawings, wherein:

5 Fig. 1 is an explanatory view showing a vehicle drive supporting system having a mounting structure of cameras on a vehicle according to the present invention;

10 Fig. 2 is a front view of a chassis which is an important portion of the mounting structure of cameras on a vehicle according to the present invention;

Fig. 3 is a sectional view along A-A line of Fig. 2;

Fig. 4 is a bottom view of the chassis according to the present invention;

15 Fig. 5 is a side view of the chassis according to the present invention; and

Fig. 6 is an exploded perspective view of the mounting structure of cameras on a vehicle according to the present invention.

20 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

A preferred embodiment of a mounting structure of cameras on a vehicle to which the present invention is applied will be explained below with reference to the attached drawings.

25 FIG. 1 is an explanatory view of a vehicle drive supporting system using cameras mounted on a vehicle. Figs. 2-6 are views showing a mounting structure of cameras on a vehicle according to the present invention.

First, a summary of the vehicle drive supporting system will be explained hereinafter. The drive supporting system has 30 a pair of charge coupled device cameras (hereinafter call CCD cameras) 10A, 10B for recognizing a forward road environment while running. An image signal obtained by these CCD cameras 10A, 10B in the vehicle running direction is inputted into an image processing unit 12, wherein the image signal is converted to a 35 various kind of forward data such as distance data.

Furthermore, the obtained forward data, a road data outputted from a navigation system (not shown), and data of a

vehicle running condition are inputted into a preview control unit (hereinafter call PCU) 14. The PCU 14 raises an alarm with regard to a distance between an own car and a forward running car, and carries out a various kind of control for a drive supporting such as cruise control. Therefore, the high accuracy of the forward data obtained by the CCD cameras 10A, 10B is indispensable for accurately operating the drive supporting system. The object of the present invention is to obtain an exact forward data through improving a mounting structure of the CCD cameras 10A, 10B on a vehicle and thereby raising a relative mounting accuracy between the CCD cameras 10A, 10B.

As shown in Fig. 1, the mounting structure of cameras of the present invention includes a chassis 16 for mounting the two CCD cameras 10A, 10B inside a vehicle as an important parts. The chassis 16 is a member which extends in a lateral direction. The CCD cameras 10A, 10B are mounted on the both ends of the chassis 16 which is formed by only one material having a high-stiffness and a high-coefficient of thermal conductivity such as an aluminum alloy.

On the central portion of the chassis 16 is integrally formed a mounting seat member 17 for fixing the chassis 16 on a front rail 40 of a vehicle body, which partially extends on a rear side of the chassis 16. Two pins 18 are attached onto an upper face of the mounting seat member 17. The pins 18 are engaged with positioning holes of the front rail 40 so as to position the chassis 16 at a predetermined mounting portion. As shown in Figs. 1 and 2, the mounting seat member 17 includes three fixing holes 21 where bolts 42 for fixing the chassis 16 are inserted, as well as the pins 18. The mounting seat member 17 is formed with a width of, for example, only about 50mm, and thus an area for mounting the mounting seat member 17 on the front rail 40 is very small.

When the chassis 16 is fixed on the front rail 40, a wedge-like taper plate 20 intervenes between the mounting seat member 17 and the front rail 40 as shown in Figs. 2 and 3. A plurality of taper plates 20 with different taper angles are prepared in advance so as to enable a vertical angle of an optical

axis of the CCD cameras 10A, 10B to change. As examples of the taper plate 20, there is a taper plate, an front side or a rear side of which is thinly formed, or which is evenly flat. When fixing the chassis 16, the taper plate 20 with a most adequate 5 taper angle is selected, so that the optical axis of the CCD cameras 10A, 10B mounted on the chassis 16 can be minutely adjusted so as to be directed into the predetermined correct direction.

As shown in Fig. 1, on a back face of the chassis 16 are 10 mounted connectors 22A, 22B for outputting an image data obtained by the right and left CCD cameras 10A, 10B. Also, as shown in Figs. 3 and 4, an underside face of the chassis 16 is covered by a circuit cover 24, in which a circuit substrate 26 for controlling each of the CCD cameras 10A, 10B is contained in a 15 space between the chassis 16 and the circuit cover 24. The chassis 16 has a hooked sectional shape extending in a lateral direction to prevent the chassis 16 from being transformed due to a weight of the CCD cameras 10A, 10B and/or an acceleration while running.

The CCD cameras 10A, 10B and the chassis 16 fixed inside 20 a vehicle are covered by an outside cover 27 made of resin, which has engaging portions 28A to be engaged with the chassis 16 at a tip end thereof, and recess portions 28 with a hole where bolts 30 are inserted. The outside cover 27 is mounted at a predetermined portion of the front rail 40 through fastening the 25 bolts 30 into the front rail 40. The recess portion 28 is covered by a cap 32 after fastening the bolts 30.

The chassis 16 is supported on the front rail 40 inside 30 a vehicle by the mounting seat member 17. As shown in Fig. 2, falling prevention brackets 34 are attached on an upper portion of both ends of chassis 16, and split pins 36 on an upper end thereof are inserted into holes (not shown) of the front rail 40. As shown in Fig. 5, the falling prevention bracket 34 is formed so as to cover the both upper ends of the chassis 16 as 35 shown from right to left in Fig. 5. A front portion 34A of the bracket 34 is connected to a front end portion 16A of the chassis 16 through a belt 38 with U-shape shown in the side view in a vehicle running direction. Whereas the belt 38 prevents the

chassis 16 from falling when mounting it, the mounting seat member 17 supports all weight of the chassis 16 including the CCD cameras 10A, 10B after the chassis 16 is fixed to the vehicle through using the taper plate 20. That is, the portions other than the 5 mounting seat member 17 of the chassis 16 are kept under the conditions disposed substantially apart from the vehicle body after being fixed.

As mentioned above and shown in Fig. 6, according to the mounting structure of cameras on a vehicle of the present 10 invention,

the CCD cameras 10A, 10B are mounted on the both ends of the chassis 16, and the mounting seat member 17 disposed in the center of the chassis 16 is attached with fixing holes (not shown) of the front rail 40 by screwing the three bolts 42, so that the chassis 15 16 can be fixed onto the front rail 40 with a small compressed area.

Thus, the CCD cameras 10A, 10B suffer little influence of vibration when running and of change of temperature inside a vehicle, so that the accuracy of mounting the both cameras 10A, 20 10B, i.e. of an optical axis thereof can be prevented from lowering. Consequently, the image data of the front environment obtained by the CCD cameras 10A, 10B can be prevented from deteriorating, and the reliability of the driving support system can be improved.

In addition, according to the present invention, the most 25 adequate one of a plurality of taper plates 20 is selected and convenient between the mounting seat member 17 and the front rail 40, so that an angle adjustment of the CCD cameras 10A, 10B can be easily made.

Furthermore, the chassis 16 supporting the CCD cameras 10A, 30 10B has enough cross-sectional area, and is formed by a uniform material with high-stiffness and high-coefficient of thermal conductivity. Therefore, a dimensional accuracy between the CCD cameras 10A, 10B is improved, and the thermal conductivity through the chassis 16 is performed quickly, so that there occurs little 35 temperature difference between the CCD cameras 10A, 10B even if daylight is given on only one side, namely a thermal balance between the both cameras can be kept. As a result, an image output

characteristic of the right and left CCD cameras is uniform, and the obtained image data is stabilized.

While there has been described what are at present considered to be preferred embodiments of the present invention, it will be understood that various modifications may be made thereto, and it is intended that the appended claims cover all such modifications as fall within the true spirit and scope of the invention.